

ON THE ARMS OF THE BELEMNITE.

By G. C. CRICK, F.G.S., etc.

Read 8th March, 1907.

PLATE XXIII.

IN a paper communicated to this Society,¹ in discussing the relationships of the fossil which Professor James Buckman named *Belemnoteuthis Montefiorei*, the present writer incidentally referred to the number of the arms of the Belemnite, and stated that it seemed "fairly safe to conclude that those Belemnites, of which any remains of the arms had been obtained, had only six *uncinated* arms."² The conclusion is so important that it seems desirable to fully set forth the evidence on which such a statement was made. This is attempted in the present paper.

The statement that the Belemnite possessed only six uncinated arms is not new, although it seems to have been generally overlooked, for Professor Huxley,³ writing in 1864 on the structure of the Belemnitidæ, says (p. 16): "I have not been able to make out more than six or seven arms in any specimen, nor has any exhibited traces of elongated tentacles, though the shortness of the arms which have been preserved would lead one to suspect their existence."

In England remains of Cephalopoda with uncinated arms have been recorded from both Lower Liassic and Oxfordian rocks. Whenever at all well preserved, each arm is seen to have borne a double row of hooklets, but the character of the hooklets of the Liassic forms is very different from that of the hooklets of the Oxfordian forms. In all cases the hooklets seem to have been placed on the inner surface of the arms, with their proximal ends towards the base of each arm; the distal end of each hooklet is pointed and turned inwards. In the Oxfordian forms the proximal end, or that which was attached to the arm, is also pointed, whilst in the Liassic examples this part of each hooklet is thickened. The hooklets of the Oxfordian specimens have been well figured by Professor Owen,⁴ who referred the species possessing them to the genus *Belemnites*, but they have long since

¹ Proc. Malac. Soc., vol. v, pt. 1 (April, 1902), pp. 13-16, pl. i.

² This fact is alluded to by Professor G. B. Howes in his address as President of the Section of Zoology at the meeting of the British Association in 1902 (Report, p. 631) as follows:—"In palæontology, history records the fact that in 1864 Huxley observed that the genus *Belemnites* appears to have borne but six free arms, a startling discovery which lay dormant till the present year."

³ T. H. Huxley: Mem. Geol. Surv. United Kingdom, Figures and Descriptions illustrative of British Organic Remains, Mon. ii, "On the Structure of the Belemnitidæ," etc., 1864.

⁴ Phil. Trans., 1844, pls. iii, v, vi.

been recognised as generically distinct therefrom and referable to the genus *Belemnoteuthis*. All the Oxfordian forms known to the present writer that exhibit hooklets have hooklets with pointed proximal ends, and are referable to the latter genus; they are not therefore considered in the present paper. The genus *Belemnoteuthis* certainly possessed *ten* uncinated arms, as is well shown by the example of *Belemnoteuthis antiqua* in the British Museum collection [B.M. No. 25,966],¹ that has been figured by Mantell² and others. This specimen also exhibits remains of the fleshy portion of the arms.

Of the remains of uncinated-armed Cephalopods from the Lias, the British Museum collection contains seventeen examples, all from the Lias in the neighbourhood of Lyme Regis and of Charmouth in Dorset. Each specimen exhibits a number of uncinated arms associated usually with an ink-bag, sometimes also with nacreous matter, and in two instances also with the guard or rostrum. In all these specimens the hooklets have thickened proximal ends, but in no case are there traces of the fleshy part of the arms. The two examples in which the remains of the animal are associated with the guard are the specimens figured as *Belemnites Bruguerianus* (pl. i, figs. 1, 1a) and *B. elongatus* (pl. i, figs. 2, 2a) respectively by Professor Huxley,³ who described and gave several drawings of the hooklets of the arms (pl. i, figs. 1a, 2a, 5, 5a). Since in both these examples, in which remains of the arms have been preserved associated with the guard, the hooklets had peculiar thickened proximal ends, it is much more than probable that all the other examples of arms bearing similar hooklets that are associated with an ink-bag and portions of nacreous matter belonged to *Belemnites*, the guards having become detached, the nacreous matter that is present having formed part of the nacreous pro-ostracum.

It must, however, be mentioned that Professor James Buckman described from the Lower Lias shales between Charmouth and Lyme Regis a specimen which he referred to the genus *Belemnoteuthis* (*B. Montefiorei*), but the present writer has already elsewhere given his reasons for believing this fossil to be the remains of a *Belemnite*.⁴

Again, Professor Dr. O. Jaekel⁵ has described from the soft dark clays of the Lower Lias of Lyme Regis a specimen which he refers to the genus *Acanthoteuthis*. The description was not accompanied by a figure, but thanks to the kindness of Dr. Jaekel and of the late Professor Dr. K. A. v. Zittel, to whom Dr. Jaekel had sent the

¹ The numbers in square brackets refer to the register numbers in the British Museum collection.

² G. A. Mantell: "Petrifications and their teachings," 1851, p. 459, lign. 100. G. A. Mantell: "Medals of Creation," 2nd ed., vol. ii (1854), p. 460, lign. 145. J. Prestwich: "Geology," vol. ii (1888), p. 218, f. 116. Oxford Clay: Christian Malford, Wiltshire.

³ T. H. Huxley: Mem. Geol. Surv. United Kingdom, Figures and Descriptions of British Organic Remains, Mon. ii, "On the Structure of the Belemnitidæ," etc., 1864.

⁴ G. C. Crick: Proc. Malac. Soc., vol. v, pt. 1 (April, 1902), pp. 13-16, pl. i.

⁵ O. Jaekel: Sitz.-Ber. Gesell. naturf. Freunde, Berlin, Jahrg. 1890, pp. 88-92.

specimen, the present writer has been enabled to see a photograph of the fossil.¹ Now the hooklets in *Acanthoteuthis* were pointed at their proximal ends just as in the genus *Belemnoteuthis*; in fact, it is not quite certain that the two genera are distinct.² The photograph, however, though not particularly sharp, shows that the proximal ends of the hooklets were thickened, and not sharp; in fact, they much more closely resemble those figured by Professor Huxley as belonging to *Belemnites* than the hooklets of *Acanthoteuthis*. But Dr. Jaekel describes the fossil so completely—the outline of the body with a terminal triangular fin near the hinder end on each side, the head, the funnel, the arms, and the remains of a dorsal pen—that if the remains had belonged to a Belemnite one would have expected to have been preserved, if not the guard, at least some indications of the phragmocone, but the author does not allude to these. The various structures here referred to are not at all clearly indicated in the photograph, though it must be admitted that, as already stated, this is by no means so sharp as one could have wished. So far as can be judged from the photograph, the present writer sees no reason for regarding the fossil as generically distinct from the forms referred to in the present paper.

Assuming, then, that the seventeen examples of Liassic uncinated-armed Cephalopoda in the British Museum above alluded to belonged to Belemnites, the number of arms may be considered. In several instances the arms are so well preserved that there can be no doubt whatever about the arrangement of the hooklets. These were arranged in a double row of opposite hooks along each arm, the hooks being largest at the mid-length of each arm, and gradually diminishing in size towards each end. The hooks were placed on the inner surface of the arm, and, in the contracted state of the arm, the bases of each pair of hooklets were almost in contact. The arrangement is shown very clearly in one of the arms (*d*) of an example [B.M. No. 47,020] in the British Museum collection that is described below as specimen No. 5 (Pl. XXIII, Fig. 5). Since in these Liassic examples the fleshy part of the arms is not usually preserved, in determining the number of the arms exhibited in any particular specimen it must be remembered that each arm is represented by a double row of hooklets.

Of the seventeen examples of Liassic Cephalopoda in the British Museum collection exhibiting uncinated arms, the only specimens showing the arms in association with a guard are the two examples already referred to that were figured and described by Professor Huxley³ as *Belemnites Bruguièrianus* (Pl. I, Figs. 1, 1*a*) and *B. elongatus* (Pl. I, Figs. 2, 2*a*) respectively. Unfortunately the

¹ The photograph included two specimens. Dr. Angermann, during a visit to the British Museum, identified for the present writer the example described by Dr. Jaekel.

² See E. Angermann, "Ueber das Genus *Acanthoteuthis*, Münst., aus den lithographischen Schiefer in Bayern": Neues Jahrb., Beil. Bd. xv, Heft 1 (1902), pp. 205-230, pl. vi.

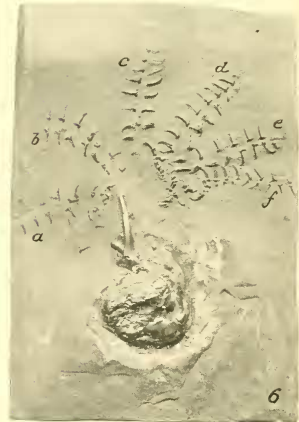
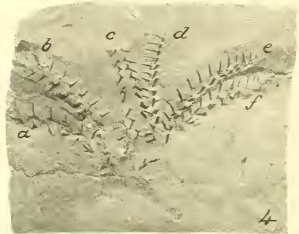
³ Op. cit.

arms are not well preserved in either of these specimens. In the example of *B. Bruguerianus* [B.M. No. 74,106], from the Lower Lias (*obtusus*-zone) near Charmouth, there are only a few scattered hooklets, whilst the arms of *B. elongatus* [B.M. No. 39,855], from the Lower Lias of Charmouth, are represented by a confused mass of hooklets. Of the other fifteen examples, in one [B.M. No. 39,857] there are merely a few solitary hooklets; in another [B.M. No. 66,360], the number of the arms is very indistinct; in two [B.M. Nos. 39,859 and 48,894], the remains of only two arms are preserved; in one [B.M. No. 47,715], there are traces of three arms; in two [B.M. Nos. C. 315 and 39,856], there are indications of three, or possibly of four, arms; in one [B.M. No. 66,359], there is a confused mass of probably four arms; and in one [B.M. No. C. 310], there are the remains of four, or possibly of five, arms. In each of the remaining six specimens six arms can be more or less clearly made out, whilst there is not a single example in which more than six uncinated arms are preserved.

Dr. Jaekel states that the specimen described by him had four uncinated arms, the outer one on each side longer than the others, but he concludes that there were originally eight such arms, the others either lying embedded in the matrix, or having been removed from the exposed surface of the fossil, a conclusion based chiefly upon the evidence of a specimen in the collection of the Berlin University, that, although on the whole not so well preserved as his own, nevertheless, according to that author, exhibited eight arms each with its double row of hooks. Besides these eight arms Dr. Jaekel considered that there was a fifth pair, probably longer than the rest, and not provided with hooks. The photograph so kindly sent me by Dr. Zittel included besides the specimen described by Dr. Jaekel another Cephalopod with uncinated arms that he had received from Dr. Jaekel. It is labelled "Lias, Lyme Regis." The hooklets have the thickened bases like those examples referred to in the present paper. For the determination of the number of the arms the photograph is not so sharp as one could wish, but in that specimen also the present writer does not see evidence of the existence of more than six arms.

Of the six specimens in the British Museum collection that exhibit six uncinated arms, four [B.M. Nos. 47,020, 47,716, 82,895, and C. 3,007] are stated to be from the Lias of Lyme Regis; one [B.M. No. 39,901] is from the Lias of Charmouth; and one [B.M. No. C. 5,026] is the type-specimen of Professor James Buckman's *Belemnoteuthis Montefiorei* from the Lower Lias shales between Charmouth and Lyme Regis. The exact horizon of the fossils has not been recorded. The remains are preserved on the surfaces of slabs.

The arms vary in length and seem to be arranged in three pairs, a short, a medium-sized, and a long pair. Since the arms are usually found to be symmetrically disposed, and as they would be arranged symmetrically around the head, it may be concluded that the body of the animal, together with any lateral appendages which it may have possessed, was wider than thick, and that the aspect of the body that



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is presented is either ventral or dorsal. The attempt to determine whether the view that is presented is dorsal or ventral, is based upon the fact that the pro-ostracum was situated principally on the dorsal side of the ink-bag; when, therefore, the pro-ostracum is seen to rest upon the ink-bag, a dorsal aspect of the fossil is probably presented, but if it passes beneath the ink-bag a ventral aspect of the fossil is probably exposed. If no remains of the pro-ostracum are visible either upon or beneath the ink-bag, the aspect of the specimen is most probably ventral, though it may possibly be dorsal, in which case the pro-ostracum would have been removed.

With respect to the order of the arms the present writer has not been able to arrive at a satisfactory conclusion. The longest pair of arms was lateral, but of the other two pairs it is somewhat uncertain which was dorsal and which ventral. The writer believes, however, that the medium-sized pair was dorsal, and the shortest pair ventral.

The fossils in which the six uncinated arms have been seen are described below. The arms being almost symmetrically placed, and also well preserved in the type-specimen of *Belemnoteuthis Montefiorei*, this fossil is described first.

Specimen No. 1 (Pl. XXIII, Fig. 2).—This is Professor James Buckman's type-specimen of *Belemnoteuthis Montefiorei*, from the Lower Lias shales between Charmouth and Lyme Regis [B.M. No. C. 5,026]. It was originally figured by that author,¹ and has since been refigured by the present writer.² Professor Buckman described the fossil as nearly 12 inches in length. It is now at most only 10 inches (=254 mm.) long, and, as the present writer has already explained elsewhere, when Professor Buckman's figure was drawn the uppermost portion of the slab containing the arms was so placed that the arms were at right angles to the rest of the body, but since then this part of the slab has been detached and replaced in such a manner that the arms now have the same general direction as the rest of the body. From the base of the arms to the posterior boundary of the ink-bag measures 126 mm. Although the relative position of the hooklets in the outermost row on each side is not quite so clearly indicated as in the rest, there are six double rows of hooklets, indicating six arms. These are almost symmetrically disposed, and occupy an angle of about 60° or 70°. The two outermost arms (*a, f*) are longer than the rest; they were apparently more slender and had their hooklets more sparsely distributed than the remaining four arms; of the latter the two outer ones (*b, e*) are a little longer than the others (*c, d*). The arms of the specimen can be grouped in three pairs; the first pair consists of the two outermost arms (*a, f*), each being about 60 mm. long or possibly more, since they appear to be interrupted by the edge of the slab bearing the specimen; the second pair includes the two intermediate arms (*b, e*), each about 46 mm.

¹ J. Buckman: Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. iii (1879), pp. 141-3, plate facing p. 142.

² G. C. Crick: Proc. Malac. Soc., vol. v, pt. 1 (April, 1902), pp. 13-16, pl. i.

long; and the third the two inner ones (*c, d*), each about 40 mm. long. The longest pair seems to have been comparatively slender; whilst the others are relatively broader and taper very quickly at their distal ends.

With regard to the relative position of the arms, it is to be noted that in the view of the fossil that is here presented the two longest arms are the outer ones on each side (*a, f*) and occupy a lower level than all the rest, whilst one or two of the hooklets of each of the medium-sized pair of arms (*b, e*) are on the top of those belonging to the smallest pair, and the medium-sized arm on the right (*e*) certainly seems to occupy a higher level than the smallest arm on the same side (*d*). Although one of the hooklets about 13 mm. from the proximal end of the arm *d* appears to rest on a hooklet belonging to the medium-sized arm *e*, the base of the arm itself seems to be below that of the medium-sized arm on the same side. On the left side some of the hooklets of the medium-sized arm (*b*) rest upon those of the smallest arm (*c*) on that side, but the base of the longest arm is not preserved; in fact, this arm is indicated merely by the impressions of a few of the hooklets (*a*). If this interpretation of the position of the arms is the correct one, in the view of the fossil that is here presented the two medium-sized arms are uppermost; the two longest, lateral; and the two smallest, the lowest.

The ink-bag is shown. There are a few pieces of the pro-ostracum upon it, whilst the slender longitudinal rib below the ink-bag may possibly be the median rib of the pro-ostracum. If so, the aspect of the fossil that is presented is probably dorsal. Although, as seen from Professor Buckman's figure, the head of the fossil when first described was placed almost at right angles to the rest of the body, the present writer has no reason to doubt that it belongs to the rest of the fossil. If the present interpretation of the order and relative position of the arms is correct, the medium-sized pair were dorsal; the longest, lateral; and the shortest, ventral.

Specimen No. 2 (Pl. XXIII, Fig. 1).—This specimen from the Lias of Lyme Regis [B.M. No. C. 3,007] shows the ink-bag and its duct bearing upon their surface fragments of the nacreous pro-ostracum, whilst at the lowest portion of the fossil a part of the phragmocone is preserved. It would seem, therefore, that it is a dorsal aspect of the animal that is here presented. There is an irregular depression in the region of the mouth. The length of the specimen from the base of the arms to the posterior end of the ink-bag, at the anterior end of the phragmocone, is 125 mm. Six arms can be seen, but though differing in length the pairs cannot be easily made out. All their proximal ends are united. Commencing the description at the extreme left of the specimen, the first arm (*a*) is 30 mm. long, but distally it ends abruptly, being intercepted by the edge of the slab; its proximal end appears to pass beneath the second arm (*b*). The hooklets are rather large in proportion to the size of the arm, and are rather wide apart. The second arm (*b*) is about 50 mm. long and appears to be complete, the distal end being quite acute. Its proximal end seems to pass along the left side of the hollow at the base of the arms. The

third (*c*) and fourth (*d*) arms are each about 45 mm. long, and each is incomplete distally. Their proximal ends pass into the hollow at the base of the arms. The fifth arm (*e*) cannot be traced for more than about 35 mm., and is obviously very imperfect; its distal end terminates very abruptly, whilst its proximal end passes along the right side of the hollow at the base of the arms; the hooklets are rather large and sparsely situated. The sixth arm (*f*) is about 30 mm. long, and is probably nearly, if not quite, complete, since the distal end is very acute; proximally it seems to pass under the fifth arm (*e*); the hooklets are very small. The order of the arms cannot be satisfactorily determined. There appear to be three pairs, as in the previous example. The third (*c*) and fourth (*d*) seem to lie uppermost, and to constitute one pair. Next to these appear to be the second (*b*) and fifth (*e*) arms, of which the proximal ends pass on each side of the hollow at the base of the arms; these constitute a second pair. The two lowest seem to be the two outer ones, the first (*a*) and sixth (*f*), which pass under the second (*b*) and fifth (*e*); these form a third pair. As to their original length it is not easy to decide, but the opinion of the present writer is that the third (*c*) and fourth (*d*) arms constitute the medium-sized pair; the second (*b*) and fifth (*e*) the longest; and the first (*a*) and sixth (*f*) the shortest. If, therefore, the aspect of the fossil is dorsal, and the interpretation of the order of the arms is correct, then the medium-sized pair were dorsal; the longest, lateral; and the shortest, ventral; just as in the previously-described example.

Specimen No. 3 (Pl. XXIII, Fig. 4).—In this example [B.M. No. 39,901] from the Lias of Charmouth, the six arms are preserved within an angle of about 120° , but they are not quite so distinct as in the two specimens already described. The specimen measures 128 mm. from the base of the arms to the bottom of the ink-bag. The arms appear to be in the order in which they are preserved; the two innermost are the uppermost, and the two outermost the lowest. Commencing the description on the left side, the first arm (*a*), which is intercepted distally by the edge of the slab, can be traced for a distance of rather more than 20 mm., when it passes beneath the second arm (*b*), which it meets at an angle; the hooklets are rather wide apart. The second arm (*b*), which is also intercepted distally by the edge of the slab, can be traced for about 37 mm.; and, in the size of the hooklets and their distance apart, closely resembles the first arm (*a*). The third arm (*c*), also imperfect distally, can be traced for a length of about 37 mm. The fourth (*d*), also imperfect distally, is visible for about 33 mm., its proximal end being apparently connected with the third arm (*c*). The fifth arm (*e*), which, judging from its acute distal extremity, appears to be nearly, if not quite, complete distally, can be traced for about 47 mm.; whilst the sixth arm (*f*), also nearly, if not quite, complete distally, is visible for a distance of about 37 mm., and then passes beneath the fifth arm (*e*). The order of the arrangement of the arms is not quite easy to make out, and at one time the present writer was inclined to think that the arms were arranged in pairs thus: *ab, cd, ef*; in which case probably a lateral

aspect of the head would have been presented. In that case, however, the third arm (*c*) would have been the highest, and the fourth (*d*) the lowest, lower even than the first (*a*) and the fifth (*e*), but this is certainly not the case. The third arm (*c*) is the highest; the fourth arm (*d*) is almost on the same level, this being a little higher than the second (*b*) and fifth (*e*), which again are higher than the first (*a*) and sixth (*f*). On the other hand, if the third (*c*) and fourth (*d*) are regarded as the shortest pair of arms, the second (*b*) and fifth (*e*) as the medium-sized pair, and the first (*a*) and sixth (*f*) as the longest pair, then it must be observed that the first (*a*) is much more extended than the sixth (*f*), the second (*b*) than the fifth (*e*), and the third (*c*) than the fourth (*d*); that is to say, the three arms on the left-hand side of the fossil are more extended than the corresponding arms on the right-hand side. On the whole, however, the latter rendering of the order of the arms seems to be more probably correct. The ink-bag bears on its surface fragments of the pro-ostracum, so that if a dorsal aspect of the specimen is presented, and the present interpretation of the relative position of the arms is correct, the third and fourth (counting from the left) arms (*c* and *d*) are the two dorsal, the second and fifth (*b* and *e*) the lateral, and the first and sixth (*a* and *f*) the ventral. The arms *b* and *e* are regarded as the lateral, because *a* and *f* seem to pass beneath them as though passing to the opposite side of the head.

Specimen No. 4 (Pl. XXIII, Fig. 6).—This interesting specimen [B.M. No. 47,716] is preserved on the surface of a small slab from the Lias of Lyme Regis. It shows the six arms arranged fan-shaped in a sector, consisting of a little more than a semicircle. The arms are all in the same plane; the ink-bag is present, and beneath it are remains of the pro-ostracum. The specimen is evidently very much squeezed together because the duct of the ink-bag touches the bases of the arms. The ink-bag with its duct is 45 mm. long, and its greatest width 25 mm. The extreme bases of the arms are not preserved. Six arms are very clearly shown, but the six do not occupy an angle of more than about 200°. As only two of the arms (*c* and *d*) are nearly complete and the others more or less imperfect, it is difficult to recognize the arms belonging to each pair. Their arrangement, however, appears to have been as they are now placed. Commencing from the left, the first arm (*a*) is 25 mm. long, and is intercepted distally by the edge of the slab; its hooklets are rather widely separated. The second arm (*b*) is somewhat shorter, but this again is imperfect distally. The third (*c*) appears to be about 30 mm. long, and is nearly, but not quite, complete distally. The fourth (*d*) is 35 mm. long, and like the third (*c*) its distal end is nearly, but not quite, complete. The fifth (*e*) is nearly of the same length as the fourth (*d*), but is not nearly so complete distally; whilst the sixth (*f*) seems to be at least 35 mm. long, but its distal end is not quite complete. The pairs of arms in this specimen then seem to be *af*, *be*, *cd*. The arms *a* and *f* appear to have been the most slender, and may have been either the shortest or the medium-sized pair, probably the former, but each is interrupted distally by the edge of the slab on

which the fossil is preserved. The arms *b* and *e* were apparently the stoutest, and, although in their present state shorter than *c* and *d*, were most probably originally longer than those arms, and very possibly were the longest pair of arms. The arms *c* and *d* are the most nearly complete, and though somewhat stout, were possibly either the shortest or the medium-sized pair, probably the latter. In this example the ink-bag rests upon the pro-ostracum, so that in all probability the ventral aspect of the animal is displayed. If an oral aspect of the arms is presented, and if the identification of the order of the arms is correct, the medium-sized pair of arms (*c* and *d*) was dorsal; the longest (*b* and *e*), lateral; and the shortest (*a* and *f*), ventral. Judging from the appearance of the hooklets, the arms may present their outer surface, as if the head with the arms spread out had been turned towards the dorsal surface with the mouth downwards, in which case the medium-sized pair of arms would be ventral, and the shortest dorsal.

Specimen No. 5 (Pl. XXIII, Fig. 5). — This example [B.M. No. 47,020], preserved on the surface of a slab from the Lias of Lyme Regis, shows the arms arranged in a fan-shaped manner, with a small portion of a dark-brownish material at their base (apparently the remains of the jaws), the ink-bag, and portions of the mantle and of the pro-ostracum. The distance from the base of the ink-bag to the base of the arms is 135 mm. The arms vary in length, but are rather difficult to arrange in pairs. Commencing on the left, the first arm (*a*), traceable for a length of about 22 mm., is imperfect distally, and proximally coalesces with the second arm. At a distance of about 5 mm. from its distal end there is the detached proximal end of an arm, about 12 mm. long, that appears to have belonged to this first arm. The second arm (*b*) is 40 mm. long, and seems to be nearly complete, at both its proximal and its distal end. The third arm (*c*) seems to be stouter than either the first or the second; it is about 22 mm. long, and is obviously imperfect at its distal end; immediately above it, and at a distance of about 10 mm. from it, there are a few detached hooklets, which seem to have belonged to this arm. The fourth arm (*d*) appears to have been about 32 mm. long, the hooklets being very clearly shown for a length of 28 mm.; its inner aspect seems to be displayed, the arrangement of the hooklets on the arm being particularly well shown. The fifth arm (*e*), about 32 mm. long, is not quite complete distally; proximally it coalesces with the sixth arm (*f*). The sixth arm (*f*) is about 40 mm. long and incomplete distally. Judging by the position of one or two of the hooklets near the proximal end of the sixth arm, this arm appears to pass under the fifth arm (*e*); a hooklet near the base of the fifth arm (*e*) rests upon a hooklet of the fourth (*d*), and one or two of the third (*c*) certainly rest upon the fourth (*d*), whilst near the proximal end a hooklet apparently belonging to the first arm (*a*) certainly passes beneath the second arm (*b*). In this view of the head, therefore, the smallest pair, *c* and *d*, appear to be at the back, the medium-sized pair, *b* and *e*, in the front, and the longest pair, *a* and *f*, at the sides. The ink-bag bears upon its surface remains of the muscular portion of the animal